

Abstract

Disclosed are a diboride single crystal substrate which has a cleavage plane as same as that of a nitride compound semiconductor and is electrically conductive; a semiconductor laser diode and a semiconductor device using such a substrate and methods of their manufacture wherein the substrate is a single crystal substrate 1 of diboride XB_2 (where X is either Zr or Ti) which is facially oriented in a (0001) plane 2 and has a thickness of 0.1 mm or less. The substrate 1 is permitted cleaving and splitting along a (10-10) plane 4 with ease. Using this substrate to form a semiconductor laser diode of a nitride compound, a vertical structure device can be realized. Resonant planes of a semiconductor laser diode with a minimum of loss can be fabricated by splitting the device in a direction parallel to the (10-10) plane. A method of manufacture that eliminates a margin of cutting is also realized.